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BIOLOGICAL NOTES ON THE BURROW AND PREY OF ANOPLIUS VENTRALIS TARSATUS (BANKS)

(Hymenoptera: Pompilidae)

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A female of *Anoplius (Anoplius) ventralis tarsatus* (Banks)[1] was observed in a burrow-making process which is quite unusual in the recorded behaviors for the North American species of the genus *Anoplius,* in that the nest was constructed in a bifurcate pattern in two separate diggings.

The wasp, when first encountered, was in the process of digging the burrow at 1:42 p.m., March 19, 1957. The locality, about two miles west of Pittsburg, Contra Costa County, California, is one generally of sandy-silt soil on the valley plain of the Sacramento River. The female wasp had selected a spot on a hard-packed, bare path traversing a heavily weeded vacant lot, but at a place where the soil had previously been loosened, presumably by some burrowing animal. The digging within the hole was interrupted every few seconds by a brief period of backing out, dragging the sand several centimeters from the burrow entrance. The paralyzed spider, a large, immature lycosid, was in evidence, lying on the bare soil about 26 cm. to the east of the burrow site. The pompilid, on finishing the excavation process, about two minutes after the observations began, seemed to experience some difficulty in locating the prey, searching generally in the right direction within an area of a square foot or more. The spider was located after about one minute and was then dragged by one leg, the wasp walking backward, toward the burrow. The female wasp left the prey four times before reaching the tunnel entrance with it, each time to search about for a few seconds in finding the burrow and then to disappear inside for a few seconds. She finally backed down the tunnel, dragging the lycosid in, at 1:47 p.m. The first reappearance of the wasp did not occur until 1:56. At first only the abdomen appeared, and sand was pulled in, apparently in the filling process. However, it soon became obvious that additional digging was going on, since the wasp

[1] Determination by Marius S. Wasbauer, Department of Entomology, University of California, Berkeley.

began reappearing with loads of freshly-dug, damp soil and dragging these back from the entrance as in the original digging process. This behavior continued for fifteen minutes. Simple backing-out appearances were interspersed with those of busily kicking and scraping the debris about. Suddenly, at 2:11 p.m., the pompilid emerged quickly, flew into the tall grass nearby and disappeared.

The area was visited at frequent intervals during the next hour, but no sign of activity was encountered. The succeeding hour was spent some distance from the nesting site, and no attempt was made to check the area. At 4:10 p.m., as the afternoon was becoming cool and windy, an excavation of the burrow was commenced. The female wasp came out of the open burrow entrance almost immediately and this time was captured.

The main part of the burrow was found to consist of a straight entrance tunnel which entered the ground at approximately a 25° angle in an easterly direction. It was about 28 millimeters in length and six mm. in diameter, terminated by an oval cell which contained the spider. The cell was about seven by eleven mm., with the long axis at right angles to the entrance tunnel. The tunnel had been filled in and repacked for only about ten mm. at its lower end. A second tunnel, of the same diameter, joined the first at right angles to it at a point about eighteen mm. from the surface entrance. It proceeded in a southerly direction for about sixteen mm. then turned abruptly down, forming a vertical terminal portion, some eighteen mm. in length, with a slightly widened, curved tip. This terminus, the lowest point in the burrow, 33 mm. below the surface level, was not produced into a "cell" in the sense of provisioning cells. One might speculate as to the purpose of this second tunnel. Due to the late hour and the associated temperature, it might be surmised that the wasp had ceased activity for the day and was utilizing the burrow as a shelter for the night. However, the question of a possible use for this portion of the burrow in a second provisioning remains unanswered.

The spider was situated in the closed-off cell in a venter-side-down position, its body oriented with the long axis of the cell. A smooth, curved, elongate, white egg had been placed in a diagonal position on the side of the abdomen. The egg and spider were kept alive, but the egg did not hatch, probably due to

desiccation. The spider was kept in a pill box, without being fed, and recovered partially. The same evening (March 19) it responded to stimuli to the legs on only one side of the body and did not seem to have any coordination. By the second day all the appendages reacted to stimuli, but the spider could not right itself when turned over, or move any distance. After the third day it seem to be fully recovered except that it did not attempt to run on a flat surface. (This is in marked opposition to other individuals of the same species observed in the field which ran a yard or more very rapidly at the slightest disturbance.) On March 24, although still weakly moving, it could not complete its final moulting, and it was preserved while in this condition. The spider was subsequently determined as an adult female of *Alopecosa gertschi* Schenkel, by Dr. Willis J. Gertsch of the Department of Insects and Spiders, American Museum of Natural History, who states *(in litt.)* that the species is widely distributed along the west coast.

The Pittsburg locality was revisited twice during the week following the observations, and no additional specimens of *Anoplius* were encountered, although individuals of the lycosid prey were quite abundant.

Although much more detailed biological observations have been given for *Anoplius imbellis* Banks (Wasbauer 1957), little is known of the nesting habits for the other members of the subgenus *Anoplius* in North America (See: Evans 1951). Essig (1926) has listed *Lycosa pratensis* (Emerton) (Lycosidae) as a prey for *A. ventralis tarsatus* (Banks) in Berkeley, California, and Williams (1919, 1931) states that the species, an introduction in Hawaii, preys on a variety of spiders there, digging a separate burrow for each one. (Given as *Psammochares luctuosus* (Cresson) by both authors.)

Literature Cited

Essig, E. O.

1926. "Insects of Western North America," 1035 pp., MacMillan Co., New York.

Evans, H. E.

1951. A taxonomic study of the nearctic spider wasps belonging to the tribe Pompilini (Hymenoptera: Pompilidae) Part II. Trans. Amer. Ent. Soc. 76:207–361.

Wasbauer, M. S.

1957. A Biological Study of Anoplius (Anoplius) imbellus Banks (Hymenoptera: Pompilidae). Wasmann Jour. Biol. 15(1):81–97.

Williams, F. X.
1919. Philippine wasp studies. Part II Descriptions of new species and life history studies. Hawaiian Sugar Planter's Assoc. Ent. Series Bull. 14:79–110.
1931. "Handbook of Insects and other Invertebrates of Hawaiian Sugar Cane Fields," 400 pp., Hawaiian Sugar Planter's Assoc., Honolulu.

BOOK REVIEW: Most Significant Animals?

Zoogeography: the geographical distribution of aminals by Philip J. Darlington, Jr.; John Wiley & Sons, Inc., New York. xi + 675 pp. 80 figs. ($15).

It will undoubtedly be a shock to many entomologists to discover that such an outstanding Coleopterist as P. J. Darlington considers the vertebrates to be the "geographically most significant animals." However, his reasons for this viewpoint as well as his other opinions and principles are clearly stated. Although the vertebrates comprise only 3 or 4 per cent of the animal kingdom, "they are the best-known animals: most familiar, best collected, best classified, with the best fossil record." Furthermore, they are varied in habits and physiology. He does concede that invertebrates show the histories of some islands better than do the vertebrates.

The introductory chapter is required reading for anyone interested in any aspect of the distribution of animals. In this chapter, Darlington discusses clearly and concisely subjects such as mapping, climate, vegetation, geological time, and dispersal as they relate to zoogeography. In addition, he defines his usage of special terms and gives his "working principles of zoogeography."

The next five chapters are detailed treatments of the zoogeography of freshwater fishes, amphibians, reptiles, birds, and mammals. For each of these groups a short account of the classification, fossil record, and pertinent characteristics is given and then is followed by discussion of their limits of distribution, transitions and barriers in distribution, dominance and competition in relation to distribution. These five chapters each end with a summary of the pattern of distribution, a history of dispersal, and a list of families of the group. The family list contains among other things the region of occurrence, main pattern of distribution, numbers of genera and species, and fossil record.

On the basis of this detail, the main pattern of vertebrate distribution, discontinuities, faunal regions, and the transitions between regional faunas are discussed in the seventh chapter. Island patterns and the evolution of patterns follow in the next two chapters. Chapter ten is concerned with what zoogeography tells of the past. In the final chapter, Darlington reviews his principles of zoogeography and then traces man's geographical history.

The zoogeography of insects is still in a very early stage of development. Consequently, no one can judge, at this time, how well Darlington's conclusions and patterns of distributions for the vertebrates apply to the insects. Entomologists working in the infant science of insect zoogeography can, if nothing else, use the vertebrate patterns as standard patterns of reference and they had best heed Darlington's working principles as this field grows and matures.—Ray F. Smith, *University of California, Berkeley.*